REMARKS

I. Status of the Application

Claims 1-20 are pending in this application. Claims 18-20 are withdrawn from consideration. In the August 29, 2003 Office Action, the Examiner:

1. Rejected claims 1-3 and 12 under 35 U.S.C. § 102(a) as allegedly being anticipated by Farkas et al., U.S. Patent No. 6,001,730 (hereinafter "Farkas");

2. Rejected claim 4 under 35 U.S.C. § 103(a) as allegedly being obvious over Farkas in view of U.S. Patent No. 5,985,045 to Kobayashi (hereinafter "Kobayashi");

3. Rejected claims 5 and 6 under 35 U.S.C. § 103(a) as allegedly being obvious over Farkas in view of U.S. Patent No. 5,869,392 to Kimura;

4. Rejected claim 7 under 35 U.S.C. § 103(a) as allegedly being obvious over Farkas in view of U.S. Patent No. 6,436,830 to Merchant et al. (hereinafter "Merchant");

5. Rejected claims 8 and 14 under 35 U.S.C. § 103(a) as allegedly being obvious over Farkas in view of U.S. Patent No. 5,780,358 to Zhou et al. (hereinafter "Zhou");

6. Objected to claims 9-11, 13 and 15-17 as being dependent upon a rejected base claim.

In this amendment, Applicant has amended claims 1, 5 and 12 to further define the inventions claimed therein. Applicant has also canceled claims 2, 4 and 18-20 without prejudice, and has added new claim 21. Applicant respectfully traverses the rejections of the claims and respectfully requests reconsideration of the pending claims in view of the foregoing amendments and the following remarks.

II. Claim 1 is Allowable Over the Prior Art

Claim 1 has been amended herein to incorporate the limitations of claim 2. Claim 2 stands rejected as allegedly being anticipated by Farkas. As will be discussed below, Farkas does not teach, suggest or disclose all of the elements of claim 1 as amended.

A. The Invention of Claim 1

Claim 1 is directed to a method that includes the steps of disposing a volume of an aqueous slurry containing an abrasive material onto a semiconductor wafer and polishing the semiconductor wafer with a polishing pad. Claim 1 further recites the step of disposing a volume of a nonaqueous solvent onto the semiconductor wafer. Thus, the semiconductor is initially subjected to an aqueous slurry, and then a nonaqueous solvent is introduced during the polishing.

B. The Examiner's Rejection

The Examiner alleged that Farkas anticipates claim 1. The Examiner correctly points out that Farkas states that the "slurry 24, illustrated in FIG. 3, contains an oxidizing agent, a carboxylate salt . . . an abrasive slurry/agent, a solvent, . . ." The Examiner also correctly notes that Farkas states that "Typical solvents used in the slurry 24 of FIG. 2 is one or more of dionized water . . . or an alcohol."

However, while Farkas arguably suggests the possibility of using dionized water *and* alcohol as solvents, Farkas does not teach using an aqueous slurry for polishing and *adding a nonaqueous solvent to the semiconductor wafer*. At best, Farkas may suggest

that at some point, both water and alcohol may be used as solvents for a slurry. However, Farkas contains *no* discussion of how the water and alcohol solvents are mixed or in what order they are introduced to the abrasive component of the slurry.

Farkas simply does not suggest that an aqueous *slurry* and a nonaqueous *solvent* are *even* mixed at all. Thus, for example, the water and alcohol solvents of Farkas may be mixed together prior to generating the slurry. Similarly, a nonaqueous slurry may be generated, and then mixed with an aqueous solvent. Finally, nothing in Farkas suggests that the either of the solvents is disposed onto the semiconductor wafer separately from the slurry.

For the foregoing reasons, it is respectfully submitted that Farkas fails to teach, disclose or suggest all of the elements of claim 1. As a consequence, the anticipation rejection of claim 1 is in error and should be withdrawn.

III. Claims 3, 7 and 8

Claim 3 also stands rejected as allegedly being anticipated by Farkas. Claim 3 depends from and incorporates all of the limitations of claim 1. Accordingly, for at least the same reasons as those set forth above in connection with claim 1, it is respectfully submitted that the rejection of claim 3 is in error and should be withdrawn.

Claims 7 and 8 stand rejected as allegedly being obvious over Farkas in view of other prior art. It is respectfully submitted that the other art cited in the rejections of claims 7 and 8 were not cited for, and do not address, the shortcomings of Farkas with respect to claim 1. (See August 29, 2003 office action at pp.6-7). Accordingly, for at least the same reasons as those set forth above in connection with claim 1, it is

respectfully submitted that the obviousness rejections of claims 7 and 8 are in error and should be withdrawn.

IV. New Claim 21 is Allowable

Claim 21 is a new claim having limitations somewhat similar to claim 4 as originally filed. In particular, claim 21 includes a step of mixing an aqueous slurry containing an abrasive material and a nonaqueous solvent in a mixing unit so as to create an aqueous slurry/nonaqueous solvent mixture prior to being disposed onto the semiconductor wafer.

In the rejection of claim 4, the Examiner acknowledged that Farkas fails to teach such a mixing step. (August 29, 2003 office action at p.4). Nevertheless, the Examiner instead alleged that Kobayashi provided such a teaching. The Examiner's reasons for the rejection are set forth below:

> Kobayashi teaches, "A chemical-mechanical polisher (10) includes a mixer section (12) that mixes components of a polishing fluid prior to introducing the polishing fluid onto a polishing section (13) of the polisher (10)" (Abstract). "For example, container 111 may include concentrated polishing fluid, and container 112 includes a diluent, such as water, an alcohol, a glycol, and the like" (column 3, lines 17-19). "A polishing fluid may only include liquids or include at least one liquid and particles" . . . which provides evidence that Kobayashi's polishing fluid is the same as applicants aqueous slurry and further reads on, mixing said aqueous slurry and said nonaqueous solvent in a mixing unit. . .

(August 29, 2003 office action at p.4).

Applicants disagree that Kobayashi "provides evidence that Kobayashi's polishing fluid is the same as applicants aqueous slurry" as contended by the Examiner. Kobayashi teaches mixing a "concentrated polishing fluid" with a "diluent". Nowhere in Kobayashi does it teach whether the *concentrated* polishing fluid is aqueous or nonaqueous.

While the concentrated polishing fluid *could* be an aqueous slurry, it *could also* be a nonaqueous slurry, or a combination of both. Moreover, it would stand to reason that the "diluent" in the container 112 would be consistent with the existing solvent in the concentrated fluid. In other words, if the concentrated polishing fluid contains alcohol, then the diluent in the container 112 would be alcohol, and if the concentrated polishing fluid instead contains water, then the diluent in the container 112 would container water.

Nothing in Kobayashi could be interpreted as suggesting mixing an aqueous slurry with a nonaqueous solvent. The mere fact that a concentrated polishing fluid may be diluted with water, alcohol or glycol does not constitute a teaching of mixing an aqueous slurry with a nonaqueous solvent.

As a consequence, it is respectfully submitted that the Examiner's obviousness rejection is based on the faulty premise that Kobayashi mixes an aqueous slurry with a nonaqueous solvent. Because the obviousness rejection relies on an incorrect characterization of Kobayashi, it is respectfully submitted that the Examiner has failed to make out a prima facie case of obviousness with respect to claim 4.

V. Claims 5 and 6

Claims 5 and 6 stand rejected as allegedly being obvious over Farkas in view of Kimura. Claims 5 and 6 depend from an incorporate all of the limitations of claim 21. Accordingly, both claims 5 and 6 include limitations directed to mixing an aqueous slurry containing an abrasive material and a nonaqueous solvent in a mixing unit so as to create an aqueous slurry/nonaqueous solvent mixture prior to being disposed onto the semiconductor wafer. (See claim 21). As discussed above in connection with claim 21,

the Examiner has admitted that Farkas does not teach such a step. In addition, in the office action dated August 29, 2003, the Examiner does *not* allege that Kimura teaches such a step. (See office action at p.5)

As a consequence, neither Farkas nor Kimura, either alone or in combination, teach or suggest all of the limitations of claim 21, and thus do not teach or suggest all of the limitations of claims 5 or 6. Accordingly, it is respectfully submitted that the obviousness rejection of claims 5 and 6 should be withdrawn for reasons independent of those discussed above in connection with claim 21.

In addition, claims 5 and 6 both contain limitations directed to increasing the weight percentage of the nonaqueous solvent during the polishing of the wafer. The Examiner cited Kimura as providing such a teaching, stating the Kimura teaches "in the CMP process, chemical polishing variables include the kind, pH, and composition of solvent, and mechanical polishing variables include the kind and concentration of slurry, the kind of polishing cloth, the pressure applied to abrasive, and the rotation speed of a carrier. . ." The Examiner states this "provides evidence that the concentration of the solvent is a so-called 'result effective variable'". The Examiner then stated that the "discovery of an optimum value for result effective variables is within the purview of routine experimentation by the person of ordinary skill in the art."

Applicant respectfully submits that routine experimentation with different solvent concentrations does not inherently require increasing the weight percentage of the nonaqueous solvent *during* the polishing of the wafer.

First, nothing in Kimura suggests that the ratio of aqueous slurry to nonaqueous solvent is a "result effective variable". Kimura at best only suggests that concentration of

some solvent is a "result effective variable". The ratio of an aqueous slurry to a nonaqueous solvent is not merely the concentration of a solvent, but rather a particular combination of components.

Second, nothing suggests that routine experimentation performed to determine a solvent concentration level entails varying the concentration level of a particular wafer while it is being polished. It would seem that the more appropriate method of experimenting to determine result effectiveness would be to try different concentrations of solvents on different wafers to assess results of the different concentrations. Accordingly, even if Kimura provided a motivation to try different ratios of aqueous slurry to nonaqueous solvent for CMP, Kimura does not provide any motivation to change the ratio on a wafer while it is being polished.

As a consequence, the prior art contains no motivation or suggestion to increase the weight percentage of nonaqueous solvent in a mixture during the polishing of a semiconductor wafer. Thus, it is respectfully submitted that claims 5 and 6 are patentable over the prior art for reasons independent of those related to the limitations of claim 21.

For all of the foregoing reasons, the obviousness rejection of claims 5 and 6 are in error and should be withdrawn.

VI. Claim 12

Claim 12 stands rejected as allegedly being anticipated by Farkas. Claim 12 has been amended to more particularly point out the claimed invention. It is submitted that claim 12 is patentable over the prior art for at least the reasons set forth above in connection with claim 1.

VII. Claim 14

Claim 14 stands rejected as allegedly being obvious over Farkas in view of Zhou. It is respectfully submitted that Zhou was not cited for, and does not address, the shortcomings of Farkas with respect to claim 12. Accordingly, for at least the same reasons as those set forth above in connection with claim 12, it is respectfully submitted that the obviousness rejection of claim 14 is in error and should be withdrawn.

VIII. Claims 9-11, 13 and 15-17 Have Been Deemed Allowable

The Examiner deemed the subject matter of claims 9-11 and 15-17 to be allowable. However, the Examiner objected to those claims as being dependent on a rejected base claims. As discussed above, claims 1 and 12, upon which claims 9-11, 13 and 15-17 depend, are allowable over the prior art. As a consequence, it is respectfully submitted that the objection to claims 9-11, 13 and 15-17 should be withdrawn.

IX. Conclusion

For all of the foregoing reasons, it is respectfully submitted the Applicant has made a patentable contribution to the art. Favorable reconsideration and allowance of this application is, therefore, respectfully requested.

Respectfully Submitted,

Harold C. Moore
Attorney for Applicant
Attorney Registration No. 37,892
Maginot, Moore & Bowman
Bank One Center/Tower
111 Monument Circle, Suite 3000
Indianapolis, Indiana 46204-5115
Telephone: (317) 638-2922